Complete Case Study of Multicast in Core Switches

Article Overview

Multicast in core switches involves efficient delivery of IP traffic to multiple receivers using protocols like PIM and IGMP, with careful design to prevent flooding and CPU overload.

Overview of Multicast in Core Switches

Multicast allows a single source to send data to multiple receivers efficiently, reducing bandwidth usage compared to unicast replication. IPv4 multicast addresses range from 224.0.0.0 to 239.255.255.255, and multicast MAC addresses use the OUI 01:00:5E, derived from the multicast IP address. Core switches handle multicast at Layer 2 and Layer 3, often using IGMP snooping to control traffic and PIM (Protocol Independent Multicast) for routing across networks .

Case Study: Cisco ACI Fabric Deployment

In a real-world deployment, a customer required end-to-end L3 multicast routing across an ACI fabric and legacy LAN. The solution used ACI release 2.1(1h) with EX switches, supporting PIM ASM, PIM SSM, Static RP, PIM Auto-RP, and PIM BSR . Key design points included:

o VRF Configuration: One VRF per tenant; multicast requires a dedicated L3Out per VRF.
o Topology: Two modules--ACI fabric and tiered LAN--connected to core devices via point-to-point L3 links running OSPF and PIM.
o RP Deployment: For Static RP, the RP was placed on the WAN edge device.
o Traffic Simulation: Spirent traffic generators simulated internal and external multicast sources and receivers.
o Multicast Flow: L3 multicast traffic traversed both the ACI fabric and legacy LAN through the core layer, ensuring seamless delivery. This deployment demonstrated integration of modern fabric-based networks with traditional core switches, highlighting the importance of proper RP placement, VRF isolation, and PIM configuration .

Practical Considerations and Challenges
o CPU Overload: Multicast traffic can overwhelm switch CPUs if too many groups or sources exist. For example, in IPTV deployments, SSDP traffic from set-top boxes created thousands of multicast entries, causing CPU usage above 80% .
o MAC Address Overlap: Multiple multicast IPs share the same MAC OUI, which can lead to flooding if IGMP snooping is not properly configured .
o Multicast Forwarding: Core switches must maintain RPF checks, DR elections, and assert mechanisms to ensure loop-free and efficient forwarding .
o L2 vs L3 Multicast: L2 multicast is limited to a bridge domain, while L3 multicast allows routing across

multiple subnets and VRFs, essential for large enterprise networks .

Best Practices

o Use dedicated L3Outs per VRF for multicast routing.
o Deploy IGMP snooping to limit unnecessary traffic on access switches.
o Place RPs strategically to optimize PIM ASM or SSM operation.
o Monitor CPU usage and multicast table size to prevent overload.
o Avoid multicast IPs in the 224.0.0.0/24 range for routed traffic to prevent broadcast-like behavior .

Conclusion

Multicast in core switches requires careful planning of routing protocols, VRFs, and switch capabilities. Real-world deployments, such as the Cisco ACI fabric case study, illustrate the integration of multicast across modern and legacy networks, emphasizing efficient traffic delivery, CPU management, and robust PIM configuration. Understanding these principles ensures scalable, high-performance multicast networks in enterprise and service provider environments .

The Video server uses multicast I have implemented Multicast routing PIM-Sparse mode by making core switch 1 as

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Bridge multicast messages are link-specific and will never be replicated to other ports. IGMP is a protocol between a host and a

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Complete Case Study of Multicast in Core Switches

Actually switch sets are either a group of core switches or upper layer switches, which is known as pod. Applying this

IP multicast routing is a method used in IP networks to efficiently deliver data from one source to multiple destinations

In the case of multicast traffic, a multicast MAC address is never used as a source MAC address. Switches treat multicast MAC

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The Multicast Forwarding Information Base (MFIB) subsystem supports IP multicast routing in the Integrated

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